
INSPECTION PROCEDURE 88200 APPENDIX D

INSPECTION OF PIPING AT FUEL CYCLE FACILITIES

Effective Date: May 28, 2025

88200.D-01 INSPECTION OBJECTIVES

- 01.01 To determine if safety-significant piping work is being performed in accordance with regulatory requirements, the licensing basis, specifications, drawings, and work procedures.
- 01.02 To determine if the applicant/licensee's system for preparing, reviewing, and maintaining records relative to safety-significant piping activities reflects work accomplishment consistent with specifications and procedures.
- 01.03 To determine if the as-built condition of safety-significant piping meets the specified design requirements, specifications, and drawings. For pipe supports and restraints, refer to Appendix E of this inspection procedure (IP).
- 01.04 To determine if the implementation of the management measures related to work activities for safety-significant piping associated with items relied-on for safety (IROFS) is effective and to verify that deviations from requirements are appropriately resolved.

88200.D-02 INSPECTION REQUIREMENTS

- 02.01 For the safety-significant items and services (SSIS) selected for inspection of piping, determine whether procedures exist in the following areas, are compatible with the management measures program for IROFS, and prescribe adequate methods to meet the licensing basis and construction specifications, where applicable:
 - a. purchase documents identifying material specifications and any special requirements, including material test reports/certification
 - b. receipt inspections
 - c. inspections covering storage and issuance of the piping and related appurtenances
 - d. handling of the piping and related appurtenances to ensure protection from physical damage or contamination while handling
 - e. installation of the piping and related appurtenances
 - f. design changes, including field changes, to ensure proper review and coordination among participating design organizations
 - g. inspection and work performance for cleaning piping

- h. configuration management
- 02.02 Determine whether the applicant/licensee has an established audit program (including plans, procedures, and audit schedule) for assessing the adequacy of work control functions and requirements, as applicable in their licensing basis, in the area of safety-significant piping construction activities, and for ensuring that examination, inspection, and if required, test personnel associated with performing tests and inspections of safety-significant activities are qualified and/or certified to perform their assigned work.
- 02.03 Ascertain whether the following safety-significant piping activities, as required by licensing commitments and applicable construction codes, are being controlled and accomplished in accordance with documents reviewed in Inspection Requirement 02.01, above:
- a. purchase documents identifying material specifications and any special requirements, including material test reports/certification
 - b. inspections covering storage and issuance of the piping and related appurtenances
 - c. handling of the piping and related appurtenances to ensure protection from physical damage or contamination while handling
 - d. installation of the piping and related appurtenances
 - e. design changes, including field changes, to ensure proper review and coordination among participating design organizations
 - f. inspection and work performance for cleaning piping
 - g. configuration management
- 02.04 Review the documentation generated for the safety-significant piping construction activities, as required by the licensing basis. Determine whether the applicant/licensee/contractor system for documenting safety-significant work is functioning in accordance with requirements. Records should be complete, reviewed by quality control, engineering personnel, or designee, as required, and readily retrievable.
- a. receipt inspection and material certification
 - b. installation inspection
 - c. nonconformance/deviation record(s)
 - d. training/qualification records of craft, and quality inspection personnel (as required)
 - e. configuration management records

88200.D-03 INSPECTION GUIDANCE

General Guidance

Inspectors should review the facility description in the integrated safety analysis, integrated safety analysis summary, or equivalent and be familiar with the SSIS being constructed at the site. The purpose of these as-built inspections is to verify that the assumptions and critical attributes reviewed during the licensing review process remain valid; the design was

appropriately translated to construction specifications; the licensee/applicant constructed the facility in accordance with these specifications; and any modifications performed complies with the licensee's configuration management program and does not impact any NRC licensing decisions.

Inspectors should also be familiar with the licensee's management measures and/or quality assurance program, if applicable, and the licensing basis associated with these measures. It is not the objective of this IP to verify the adequacy of the applicant/licensee's management measures program, but inspectors should be prepared to identify potential gaps in the implementation of management measures for future inspections. Inspectors should complete this appendix by inspecting the attributes listed in this appendix for as-built piping work with a focus on SSIS, such as IROFS, or regulatory requirements, as applicable. Inspectors should also coordinate this appendix with inspection of pipe supports and restraints (Appendix E of this IP) for efficiency.

Inspectors should contact the applicant/licensee prior to the onsite inspection to help determine what samples are to be inspected. Observation during in-progress activities, like construction, installation, and testing, is desirable but not required. If necessary, inspectors may select completed systems for inspection. Inspectors should not attempt to inspect all available samples but may expand if significant concerns with the applicant/licensee's control of installation/construction arise in this functional area.

Inspectors should collect applicant/licensee procedures, specifications, and work completion records in advance. If unable to review these documents in advance of the onsite inspection, then the licensee should be notified that these documents, and any other relevant documents, should be available when the inspector(s) arrives at the site.

Inspectors should choose one or more safety-significant piping systems and review the areas listed in Inspection Requirements 02.01 through 02.04 to the extent practical and may use their judgment in determining which areas to concentrate on if time is limited.

03.01 Inspection Requirement 02.01

- a. Review construction specifications related to safety-significant piping and ascertain whether the specified technical requirements conform to the commitments contained in the licensing basis.
- b. Review piping procedures and as applicable, verify they specify provisions for adequate onsite engineering direction, are appropriate and adequate related to procurement and use of materials, specify adequate control of hold points, and provide adequate controls for design changes and incorporation of design changes into as-built drawings.
- c. Determine if appropriate and adequate procedures in the following areas are compatible with the management measures program, and prescribe adequate methods to meet the construction specifications, where applicable:
 1. purchase documents identifying material specifications and any special requirements, including material test reports/certification
 2. receipt inspections
 3. inspections covering storage and issuance of the piping and related appurtenances

4. handling of the piping and related appurtenances to ensure protection from physical damage or contamination while handling
 5. installation of the piping and related appurtenances
 6. design changes, including field changes, to ensure proper review and coordination among participating design organizations
 7. inspection and work performance for cleaning piping
 8. configuration management
- d. For IROFS, determine if procedures are compatible with the management measures program, and prescribe adequate methods to meet the construction specifications.

03.02 Inspection Requirement 02.02

- a. Review applicant/licensee's established audit program (including plans, procedures, and audit schedule) for assessing the adequacy of work control functions and requirements in their licensing basis, as applicable, in the area of safety-significant piping construction activities.
- b. Review audit program to verify if examinations and inspections are performed in accordance with applicant/licensee's requirements and if test personnel associated with performing tests and inspections of safety-significant piping construction activities are qualified and/or certified to perform their assigned work.
- c. Verify records establish that required audits, as applicable, were performed and that deficiencies identified during audits were tracked and corrected.

03.03 Inspection Requirement 02.03

Ascertain whether the following activities, as required by licensing commitments and applicable construction codes, are being controlled and accomplished in accordance with the requirements of the documents reviewed in Inspection Requirement 02.01, above:

- a. Purchase documents identifying material specifications and any special requirements. Verify the following material test reports/certification (as applicable):
 1. chemical composition
 2. physical characteristics
 3. nondestructive examination results
 4. heat treatment history
 5. welding of prefabricated sections
- b. Storage and issuance of the piping and related appurtenances. Verify the following provisions exist for:
 1. segregation of sizes and types of material
 2. storage identification
 3. storage conditions/protection
 4. confirmation of issue of specified material

- c. Handling of the piping and related appurtenances. Ensure protection from physical damage or contamination while handling.
- d. Installation of the piping and related appurtenances. Verify that the following meet applicable requirements:
 - 1. location
 - 2. grinding, cutting, bending, etc.
 - 3. piping system tolerances
 - 4. cold spring
 - 5. installation records to be generated during installation
 - 6. type, size, location and adjustment of hangers, bellows, restraints, snubbers
 - 7. clearances to prevent interference
 - 8. hydrostatic testing (where required)
 - 9. hold points
 - 10. removal of arc strikes
- e. Design changes, including field changes. Verify proper review and coordination among participating design organizations. Determine whether there have been significant design changes subsequent to the issuance of approved installation drawings. Review the implementation of the licensee's/contractor's design control measures, including the necessity for a revised stress analysis, as appropriate, to determine whether design control procedures were properly followed.
- f. Inspection and work performance for cleaning piping. Verify the following including provisions for:
 - 1. cleaning materials and conformance to specifications, concentration, temperature, and use
 - 2. cleanliness criteria and measurement methods
 - 3. removal and installation of metering devices, orifice plates, valve internals, etc., that are removed from system to facilitate flushing
 - 4. installation and removal of fine strainers, blind flanges, temporary piping, and dams
 - 5. record-keeping requirements

Observe activities relative to safety-significant piping, such as handling; cleanliness control; installation of pipe spools, fittings, and bellows; cutting; grinding; bending; supporting; cleaning and flushing; hydrostatic testing; and quality related inspections.
- g. Configuration management. For the activities observed during Inspection Requirement 02.03., verify if changes occurred during these construction activities, the applicant/licensee properly controlled and documented these changes for engineering review, approval, and subsequent incorporation into the final as-built drawings, as applicable. Verify these actions were completed in accordance with their procedures and management measures.

03.04 Inspection Requirement 02.04

Ascertain whether for the safety-significant piping construction activities, the applicant/licensee/contractor system for documenting safety-significant work is functioning in accordance with requirements.

- a. Receipt Inspection and Material Certification. Select records applicable to the receipt of lots or shipments. Select records applicable to the storage, and storage inspection of lots or groups of piping and associated items.
 1. Records confirm that required material characteristics, performance tests, nondestructive tests, environmental qualification tests, and other specification requirements are met, as required.
 2. Receipt inspection and storage records indicate that, where appropriate, defective or incorrect components, parts, and materials are controlled and prevented from installation and possible use.
 3. Documentation has been prepared and maintained as required by receipt inspection and documentation storage instructions.
- b. Installation Inspection.
 1. Records confirm that specified materials and components were installed as specified and that the required construction inspections were performed, and acceptance criteria are defined.
 2. Review licensee and contractor requirements covering the span of records for piping. Determine the initiation point for those records sampled and, importantly, the effectiveness of those responsible for reviewing the records for accuracy and completeness and ensuring that the recorded information meets documentation requirements. To determine the effectiveness of the licensee or contractor system for documenting work in this area, verify that:
 - (a) Type and classification of pipe comply with appropriate drawings and specifications.
 - (b) Location, spacing, and critical clearances meet licensee's specifications and have been verified by construction quality control inspections.
 - (c) The required scope of licensee construction quality control inspections was met.
 - (d) Weld identification/location corresponds to respective weld card, drawing, work order, or other welding documentation.
 - (e) Welding material used corresponds to the material specified.
 - (f) Welders were qualified to the welding procedures used and welding procedures were qualified in accordance with licensing basis and building code requirements.
 - (g) The records confirm that for welding activities where attachments are welded directly to piping, the welding specifications used are the same or equivalent to

the ones used for pipe welding, including preheat, post weld heat treatment, and nondestructive examinations.

3. Review and evaluate pertinent quality records in a sampling of the areas listed below. Determine whether:
 - (a) Adequate preparation, control, review, and evaluation of these records have been made.
 - (b) Records reflect that appropriate requirements have been met.
 - (c) The system of records is functioning properly.

c. Nonconformance/Deviation Record.

1. Records include current status of these items. Nonconformance reports include the status of corrective action or resolution, (e.g., determine whether adequate corrective action is being taken when test results are not within tolerance or acceptance criteria.)
2. For the inspection, review and evaluate a sampling of reports applicable to nonconformances or deviations. Determine whether:
 - (a) Records are complete and promptly reviewed by qualified personnel.
 - (b) Records have been routinely processed, evaluated in a timely manner and controlled through established channels, for resolution of the root-cause as well as the immediate problem.
 - (c) Records are properly identified and stored, indicate current status, and can be retrieved in a reasonable time.
 - (d) Nonconformance reports include the status of corrective action or resolution, and adequate justification is provided for use-as-is disposition.

d. Training/Qualification Records of Craft, and Quality Inspection Personnel. Records establish that quality inspection personnel, as applicable, are adequately qualified for their assigned duties and responsibilities and that craft personnel have been trained in their assigned tasks. Records are complete and current and show which activities inspectors are qualified to perform.

e. Configuration Management Records. Review and evaluate a selected sample of configuration management records, and determine whether:

1. Records associated with design and field changes, as well as related work and IP changes, reflect that timely review and evaluation of design and field change documents have been performed by personnel who are qualified.
2. Records of periodic inspections ensure that only the most recent approved documents, including design changes, were used in the field.
3. Design changes are subject to adequate design control, including consideration of the impact of the change on the overall design and on as-built records.

4. Records of nonconformance's to design requirements include preparation of a nonconformance report even if the nonconformance is resolved through the design-change process.

03.05 Additional Guidance

Note: Personnel Interviews. Informal interviews with field-craft and inspection personnel may be randomly conducted to determine how well employees know the requirements of their work activity. Ascertain whether a sufficient number of adequately qualified quality control inspection personnel, if required, are at the construction site, commensurate with the work in progress, and adequately performing their assigned duties through the established organizational structure.

- a. "Material Test Report" is a generic expression meaning a report of test results to confirm that material, chemical and physical properties are consistent with the applicable specification. Vendor terms used, which can be identified with the expression "Material Test Report," include:
 1. ladle analysis (sample of molten metal)
 2. check analysis (sample of solidified metal)
 3. Chemical Test Report or Certified Test Report (CTR)
 4. Material Test Report (MTR) usually includes chemical and physical tests
- b. The generic terms CTR and MTR should not be confused with the term "Certification." A "Certification" is a document issued in lieu of actual quality documentation records stating that the quality requirements contained in specifications and purchase orders have been met.
- c. "Quality Release Form" and "Certificate of Equipment" are examples of generic designations for forms used by manufacturers to serve as certifications of quality (in lieu of original quality documentation) for components and equipment.
- d. Prevalent errors and concerns. Areas in which the inspector should be alert to potential generic issues. This section is included to provide background for inspectors on past piping issues related to construction experience at previous projects. (Note: These are not listed in order of their perceived importance to safety.) These areas include:
 1. Status of protective measures at the time of site receipt and initial storage of piping and piping system components.
 2. Adequacy of dunnage for piping and piping system components during storage. Dunnage treated with fire retardants may expose pipe to excessive levels of halogens and chlorides.
 3. Continued adequacy of such things as end caps for piping and protective coverings for weld prep areas.
 4. Weather protection in the form of canvas or plastic covering. In most deficient cases, the original protective covering was adequate, but inattention to damage and normal "wear and tear" led to substandard or unacceptable protective covers.

5. Storage areas located on sandy soil require special attention to avoid the entry of wind-driven sand particles into piping components.
6. Improper location of storage. In some instances, storage locations are selected without consideration for construction traffic patterns, or possible falling objects and/or missiles.
7. Inadequate or illegible piping identification. (Damaged by handling and/or environment.)
8. Power grinders used for weld preparation of pipe that result in violation of minimum wall thickness.
9. Piping runs containing mud, sand, and other foreign material.
10. Incorrect size orifices installed in pump recirculation lines.
11. Surfaces for welding not properly free of paint, oil, rust, or other material that is detrimental to welding.
12. Drawings or other records fail to show evidence of actual piping components installed in pipeline or are not a current revision.
13. Piping changes without proper design change authorization.
14. Repairs of linear indications on pipe spool pieces not properly performed as to testing for wall thickness and blending uniformly into the surrounding surfaces.
15. Controls over the installation/removal of cleaning and flushing devices are inadequate.
16. Refer to Inspection and Enforcement (IE) Bulletin 79-14 for additional concerns relating to as-builts.

88200.D-04 RESOURCE ESTIMATE

This appendix is intended to provide inspection requirements and guidance applicable to a wide variety of potential construction projects at both existing and new fuel cycle facilities (FCFs). These projects may vary greatly in scope, complexity, and potential risk to public health and safety. Recommended inspection scope and hours for a specific new FCF will be documented in the principal inspection plan (PIP) for that facility developed in accordance with Inspection Manual Chapter (IMC) 2694, "Fuel Cycle Facility Construction and Pre-Operational Readiness Review Inspection Program."

Additionally, this IP can be used to provide additional inspection guidance for plant modification inspections at existing facilities but is not required to be implemented for these projects. Use of this appendix, or sections of this appendix, for modifications at existing FCFs, would be done on a case-by-case basis, in accordance with IMC 2600, Appendix B, "NRC Core Inspection Requirements."

88200.D-05 PROCEDURE COMPLETION

This IP is complete when the applicable appendices or applicable appendix sections are completed for the facility, as determined by the PIP. Inspectors are not expected to complete every activity in the appendices of this IP. Instead, inspectors should prioritize inspection activities based on 1) importance of the activity to safety, 2) availability of the onsite activity at the time of the inspection, and 3) available inspection resources. This appendix does not need to be completed if there are no SSIS covered by this appendix at a FCF.

88200.D-06 REFERENCES

Refer to licensing basis requirements for applicable codes and standards for each fuel facility.

NRC IE Bulletin 79-14, "Seismic Analysis for As-Built Safety-Related Piping Systems"

END

List of Attachments:

Attachment 1: Revision History Table

Attachment 1: Revision History for IP88200 Appendix D

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional Non-Public Information)
	ML24215A335 05/28/25 CN 25-014	Discipline specific appendix developed to provide technical inspection guidance for new construction and major modifications activities for fuel facilities with varying technologies, size, licensing requirements, etc.	N/A	N/A